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APS Renewal: Beamline Controls Software in Five Years

Beamline controls software is vital to the efficient, flexible, and easy to use operation of all APS beamlines. This software is used to control the beamline optics, sample positioning, and detectors. The APS has standardized on EPICS as the underlying architecture for beamline controls on all facility beamlines, and most CAT beamlines. The choice of EPICS allows collaboration with the accelerator controls group, and indeed with many other groups around the world. That being said, improving the extent of interaction between the accelerator controls group and the beamline controls group should be a goal for the next five years. There are currently tools that could be better shared, and more importantly the development of new and better tools in the future should be coordinated with all of the controls personnel at the APS.

Some of the areas that should be targeted for improvement and development in the next 5 years are:

- 1) Development of higher level tools for managing IOCs. There are few common tools used by beamlines for managing EPICS devices on beamlines, such as motors, detectors, etc. Tools that make it easy to add new devices, including save/restore, change device configurations, etc. would be very helpful.
- 2) Better tools for logging and diagnostics. Too often when intermittent problems arise one finds that there is no useful data being logged, making the problems hard to diagnose.
- 3) Better tools for realtime display of data as it is being collected. The tools that exist are getting old and are no longer well supported. Modern tools are needed for this important task.
- 4) Continue the transition away from VME/vxWorks IOCs to IOCs running on higher-powered and more modern computer systems (e.g. Linux, Windows, RTEMs) where appropriate. Improve, standardize and deploy the tools to manage such soft IOCs, including logging, remote access, automatic startup, etc.
- 5) Develop more specialized data acquisition programs, and standardize them around the APS. There should probably only be one program for EXAFS data collection, one program for tomography, one program for diffractometer control, etc. It is a waste of resources for multiple applications to continue to be developed and supported for these relatively standard applications. The programs must have the flexibility to allow for the new types of experiments that will be done in the future.
- 6) Develop the infrastructure and a framework for high-performance data acquisition. Modern detectors and smart controllers are capable of rapid on-the-fly data collection. However, these capabilities are often not being appropriately used because there is no easy mechanism to incorporate them into the existing data acquisition and control systems.
- 7) Coordinate the beamline controls and data acquisition software with data reduction and analysis software to facilitate the real-time feedback into experiments.